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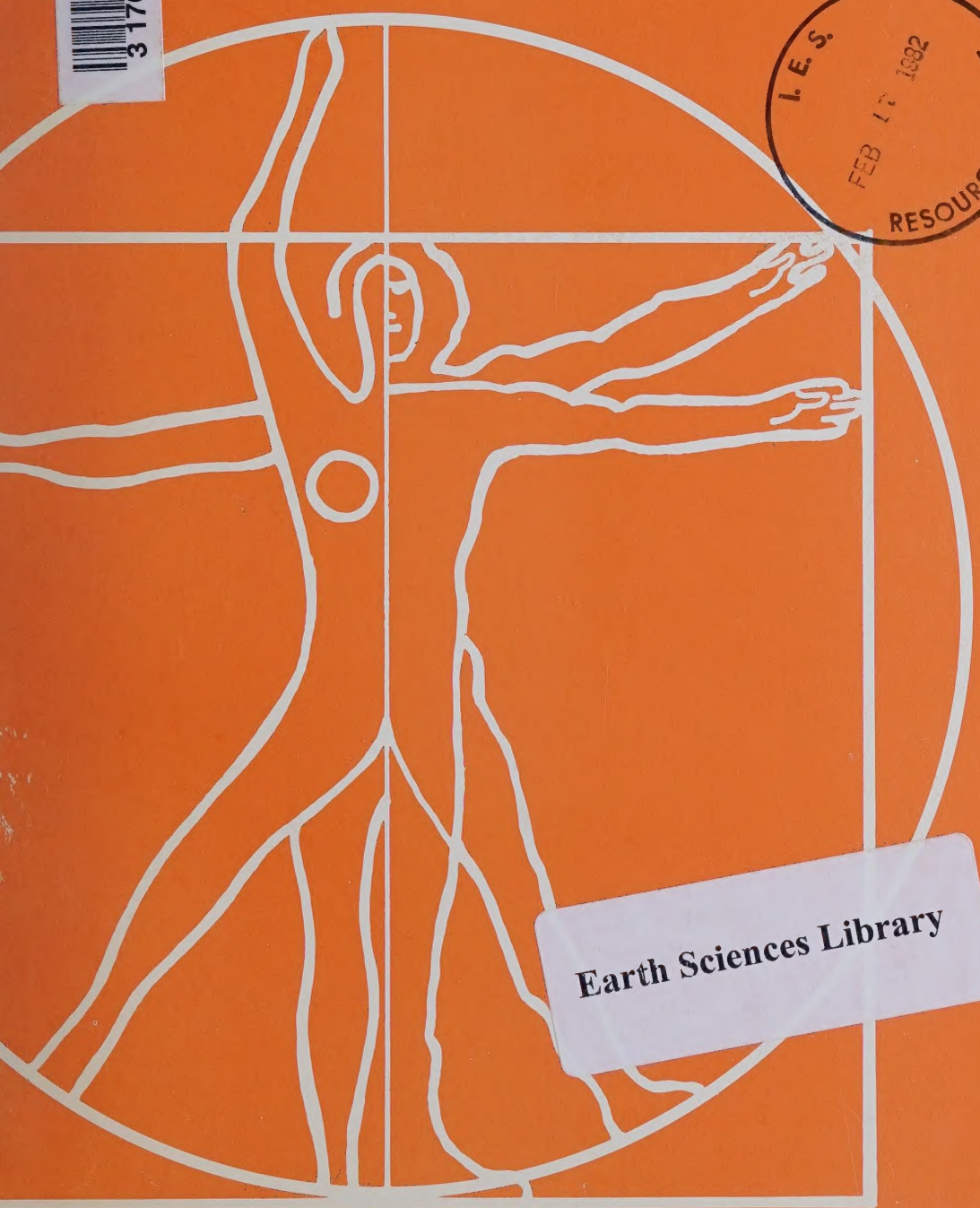

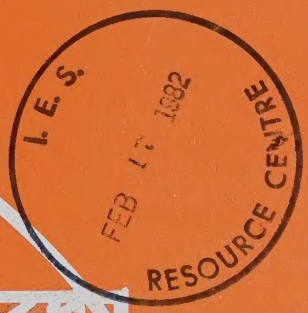

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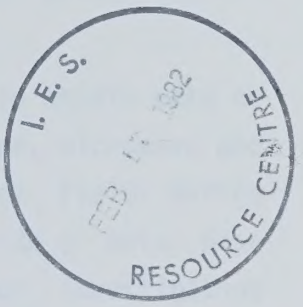
CANADA-WIDE SURVEY OF NON-IONIZING RADIATION EMITTING MEDICAL DEVICES

PART I

SHORT-WAVE MICROWAVE DEVICES



Environmental Health Directorate

Health Protection Branch

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PREFACE

The Radiation Protection Bureau of the Environmental Health Directorate, Health Protection Branch, carries out surveys of devices emitting non-ionizing radiation to investigate potential radiation hazards to personnel and the general public. Identification of potentially hazardous devices is made, and detailed investigations can result in the introduction of regulations under the Radiation Emitting Devices Act, safe use guidelines or safety codes for these devices.

A Canada-wide survey was initiated to obtain data on the number, location and types of ultrasound, microwave and radio-frequency devices used in the medical field during 1977. These results were designed to provide a data base on which program priorities could be set for investigating devices that could adversely affect the health of Canadians. This report summarizes the results of the Canada-wide survey of short-wave and microwave medical devices.

The survey was designed and conducted in cooperation with the Hospital Section of Statistics Canada. This report was prepared by Dr. M.A. Stuchly, M.H. Repacholi and D. Lecuyer of the Radiation Protection Bureau. Computer processing of the survey data was performed by Dr. R.S. McCullough, G.R. Symonds, D. Biggs and D. Hobbs of the Statistics and Data Processing Division, Environmental Health Directorate.

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INTRODUCTION

A Canada-wide survey of non-ionizing radiatio emitting medical devices was performed in 1977-1978. In the fall of 1977 a questionnaire requesting information on short-wave and microwave diathermy devices and blood warmers was sent out, together with a similar questionnaire for ultrasonic devices.

The results of the survey will assist in assessing the need, priorities and requirements of regulations limiting non-ionizing radiation exposure from medical devices.

Questionnaires were sent to 4254 institutions and 2576 (61%) returned them completed. The following facilities were included in the survey: 1341 hospitals; 1887 chiropractic clinics; 300 physiotherapy clinics, and 726 sports medicine clinics. Only 148 institutions, constituting 5.7% of those which replied, reported use of microwave devices. All of the microwave devices reported were diathermy devices; no microwave blood warmers were reported. Six hundred and eighteen facilities (24% of those which replied) reported use of short-wave diathermy devices.

The questionnaire requested information on the type of equipment used and its maintenance, the number of patients, treatment regimes and typical exposures, operator qualifications and reported adverse effects. All the data referred to the year 1977.

All data from completed questionnaires underwent a time-consuming, rigorous validation procedure. Where there was some doubt as to the accuracy of data, it was eliminated from the analyses.

QUESTIONNAIRE DESIGN

A copy of the questionnaire is enclosed in Appendix A. The format selected was similar to the questionnaire for ultrasonic devices. Three types of devices were covered by the questionnaire, namely radio-frequency (short-wave) diathermy, microwave diathermy and microwave or radio-frequency blood warmers.

The questionnaire consisted of five parts. Part one dealt with blood warmers and requested information on medical services where these devices are used. Part two referred to therapeutic short-wave and microwave devices (diathermy) and listed parts of the body treated. Part three, in the form of a table, requested the following information for all three types of devices: manufacturer, model designation, number of units of each model, number of units of blood treated or number of patients treated in a period of one year, treatment parameters, i.e. operating frequency, exposure power density and duration, profession and training of the operator, calibration of the equipment and adverse effects (yes or no). Part four requested elaboration on operator training, and part five asked for details of the adverse effects, if any were reported.

SURVEY RESULTS

Number of devices

Replies to the survey of radio-frequency and microwave medical applications were received from 654 institutions. Data was sought on use of microwave blood warmers, therapeutic short-wave diathermy and microwave diathermy. None of the facilities surveyed reported the use of microwave blood warmers. Short-wave diathermy was used in 618 institutions, while microwave diathermy in 148 institutions. Figure 1 shows number of institutions for each facility type, i.e. hospital, chiropractic clinic, physiotherapy clinic and sport medicine clinic, which use short-wave and microwave diathermy. The geographical distribution (by province) of facilities using short-wave and microwave diathermy is shown in Figure 2. Table 1 shows the number of facilities in all provinces which use diathermy, and is arranged according to the facility type. The percentage of facilities using short-wave or microwave diathermy devices is shown in Figure 3 (100% = Number of facilities using short-wave and/or microwave diathermy).

There were 1393 short-wave and 185 microwave diathermy devices in use in the facilities surveyed. Information on the number of devices in various provinces and facility types is summarized in Tables 2 and 3, respectively.

Manufacturers and types of devices

Ninety-eight models of the short-wave devices manufactured by 34 firms were reported. The microwave devices comprise 31 models manufactured by 12 firms. Major manufacturers of short-wave and microwave devices are

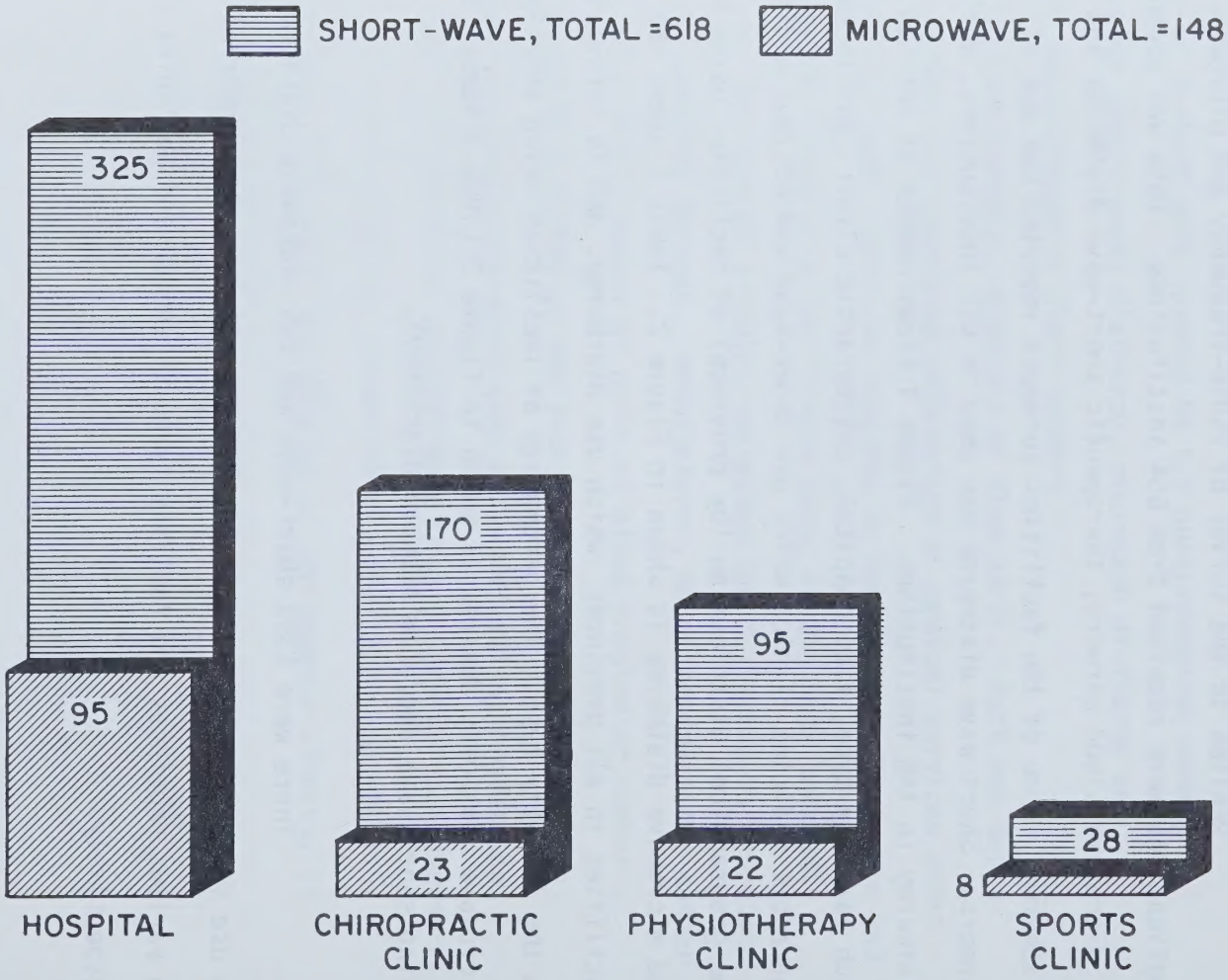

Fig. 1 Number and types of facility using short-wave and microwave diathermy devices.

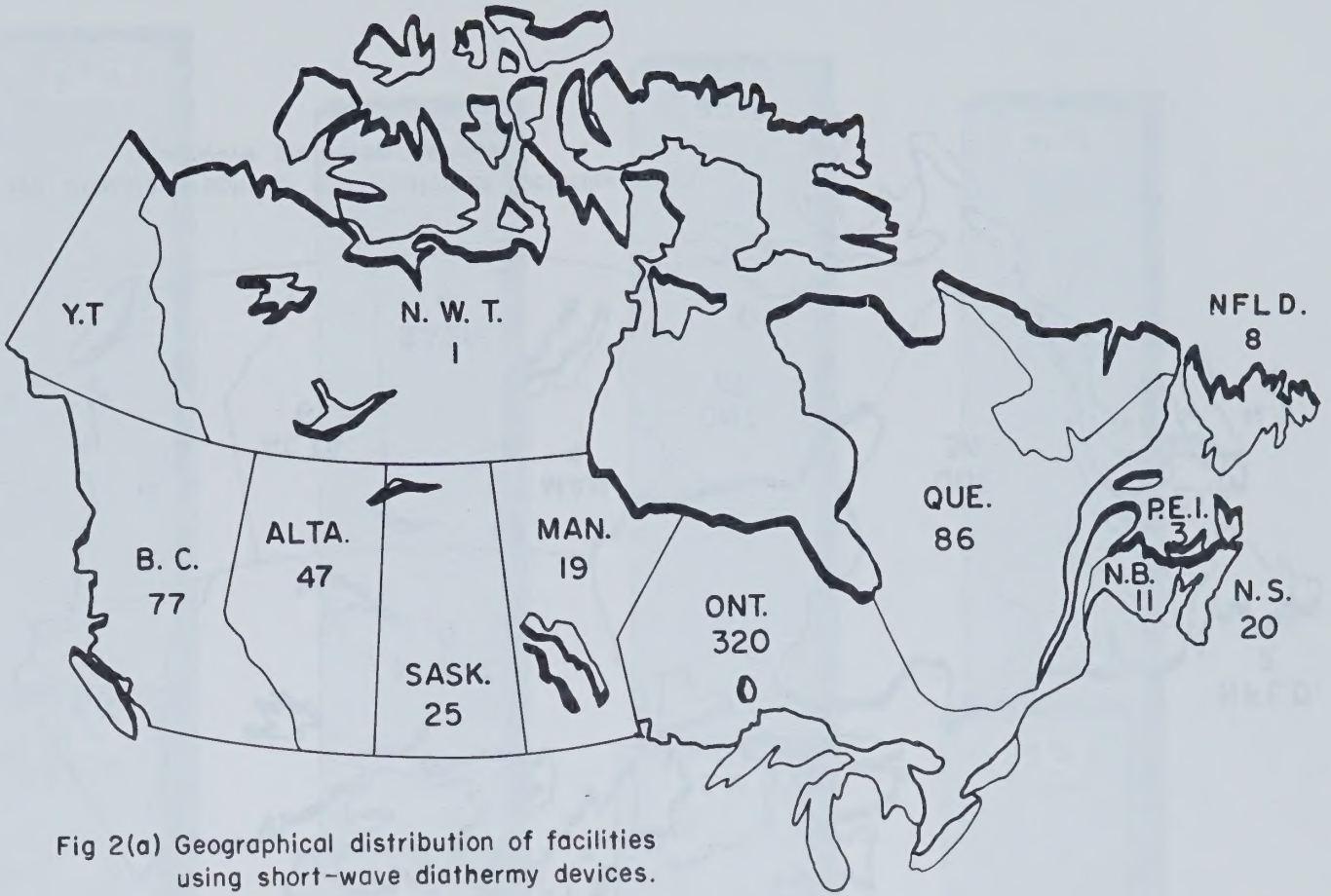

Fig 2(a) Geographical distribution of facilities using short-wave diathermy devices.

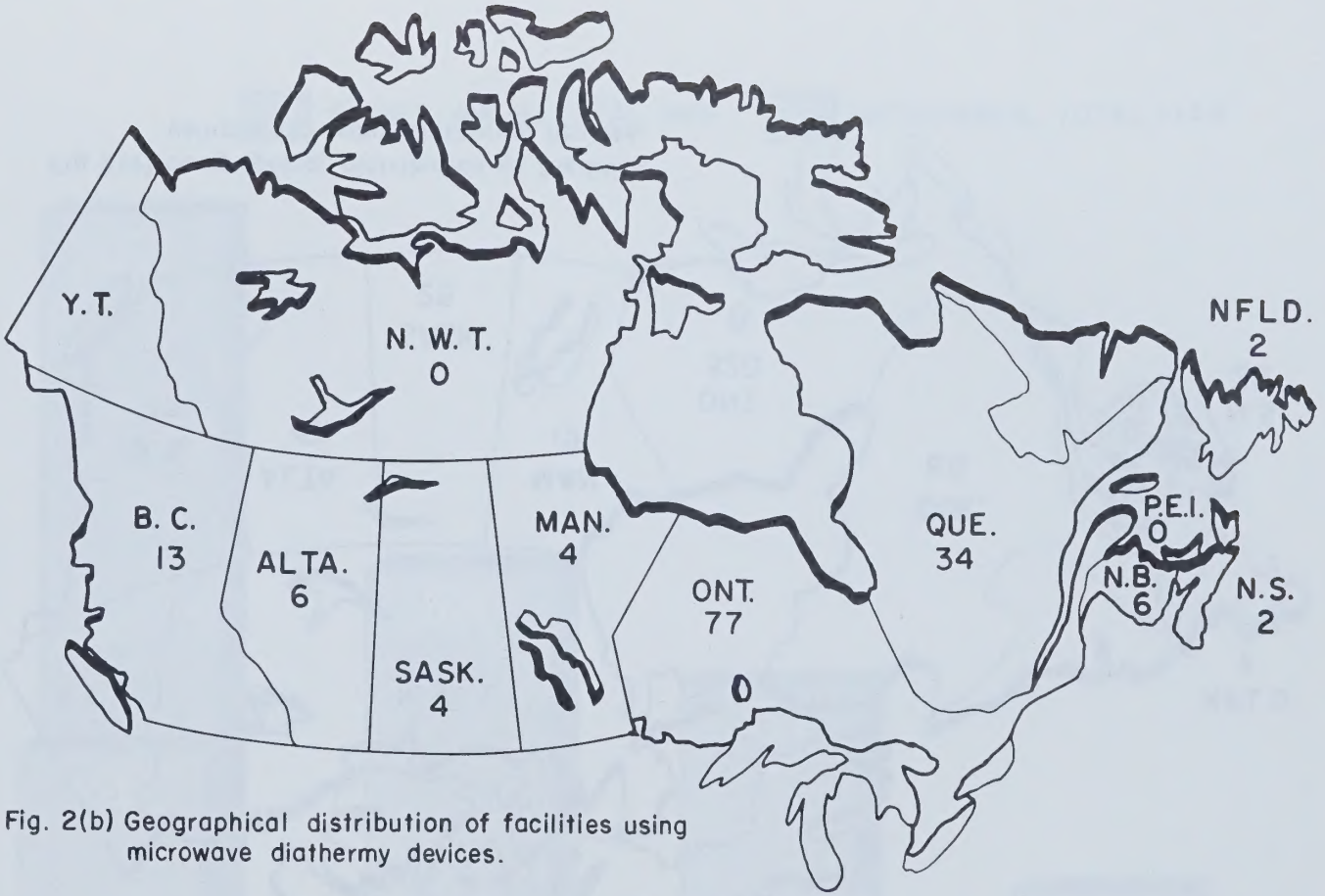

Fig. 2(b) Geographical distribution of facilities using microwave diathermy devices.

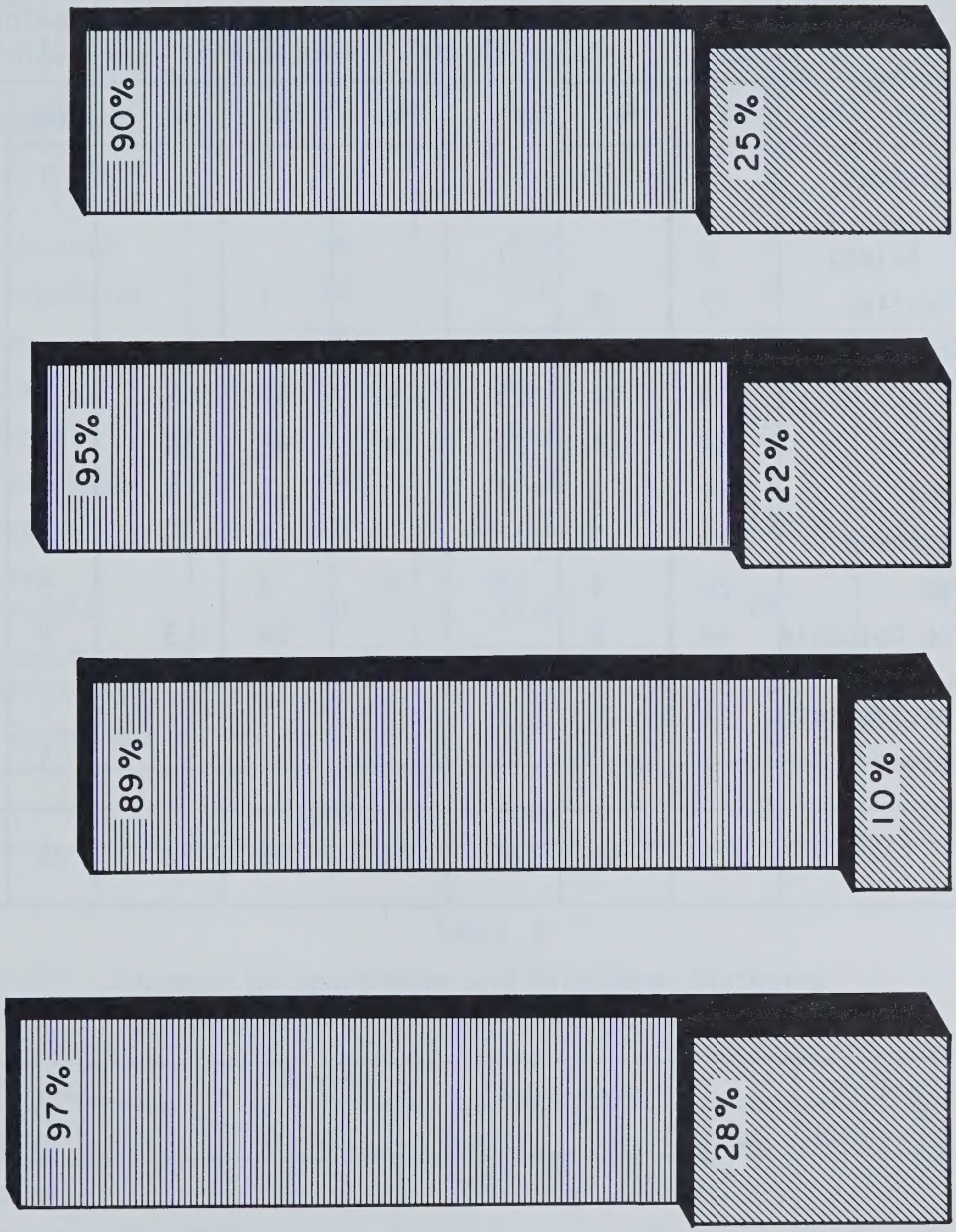

Fig. 3 Percentage of facilities using short-wave and microwave diathermy devices.

TABLE 1

Number of Facilities Using Short-Wave (SW) and Microwave (MW) Diathermy Devices

Facility / Province	Hospital		Chiropractic Clinic		Physiotherapy Clinic		Sport Medicine Clinic	
	SW	MW	SW	MW	SW	MW	SW	MW
Newfoundland	7	1					1	1
Prince Edward Island	2		1					
Nova Scotia	19	2			1			
New Brunswick	11	6						
Quebec	53	24	20	8	12	2	1	
Ontario	134	44	129	14	46	16	11	3
Manitoba	11	3	7		1	1		
Saskatchewan	17	3			8			1
Alberta	26	4	13	1	3		5	1
British Columbia	44	8			24	3	9	2
Northwest Territories	1							
Not stated							1	
Total	325	95	170	23	95	22	28	8

TABLE 2

Number of Short-Wave and Microwave Diathermy Devices in Various Provinces

Device / Province	Short Wave		Microwave	
	Number	% of total	Number	% of total
Newfoundland	11	.8	2	1.1
Prince Edward Island	4	.3	0	0
Nova Scotia	36	2.6	2	1.1
New Brunswick	28	2.0	8	4.3
Quebec	170	12.2	39	21.1
Ontario	791	56.8	94	50.8
Manitoba	41	2.9	5	2.7
Saskatchewan	46	3.3	4	2.1
Alberta	102	7.3	7	3.8
British Columbia	161	11.6	24	13.0
Northwest Territories	1	.1	0	0
Not Specified	2	.1	0	0
Total	1393	100%	185	100%

TABLE 3

Number of Short-Wave and Microwave Diathermy Devices in Each Facility Type

Device / Type of Facility	Short-Wave		Microwave	
	Number	% of total	Number	% of total
Hospital	751	53.9	118	63.8
Chiropractic Clinic	318	22.8	31	16.7
Physiotherapy Clinic	250	18.0	26	14.1
Sport Medicine Clinic	74	5.3	10	5.4
Total	1393	100%	185	100%

listed in Tables 4 and 5, which also indicate the number of models and devices produced by each manufacturer and in use in Canada in 1977. The most popular models are shown in Tables 6 and 7 for short-wave and microwave devices, respectively. The devices (5 models) listed in Table 6 constitute 60.3% of all short-wave diathermy devices reported in use during the survey. The models of microwave diathermy, Table 7, account for 63.7% of all the devices reported in this category.

A complete list of manufacturers and models of short-wave and microwave devices is given in Appendix B.

Treatment

Figure 4 provides information on the parts of the body treated by short-wave and microwave diathermy. The numbers indicate treatments reported by all the facilities surveyed. More detailed information on the parts of the body treated is given in Table 8.

The mode (continuous wave or pulsed wave) and duration of treatment are shown in Table 9. These parameters were reported for 90.3% of short-wave devices and 85.4% of microwave devices. Only 32% and 41% of respondents sent information on the frequency of operation of short-wave and microwave devices, respectively, and none provided meaningful information on the power density. Eighty-seven percent of those who responded gave 27.12 MHz as the operation frequency of short-wave devices, and 78% of respondents indicated 2.45GHz for microwave devices.

TABLE 4

Major Manufacturers of Short-Wave Diathermy Devices

Manufacturer	Number of Models	% of Models	Total Number of Devices	% of Devices
Siemens	11	11.5	675	48.5
Burdick	13	13.5	232	16.6
Sterne	7	7.3	148	10.6
Birtcher	6	6.2	70	5.0
Diapulse	2	2.1	65	4.7
Other	57	59.4	203	14.6
Total	96	100.0	1393	100.0

TABLE 5

Major Manufacturers of Microwave Diathermy Devices

Manufacturer	Number of Models	% of Models	Total Number of Devices	% of Devices
Siemens	5	16.1	67	36.2
Burdick	5	16.1	56	30.3
Bosch	7	22.6	26	14.1
Raytheon	5	16.1	13	7.0
Birtcher	2	6.5	10	5.4
Other	7	22.6	13	7.0
Total	31	100.0	185	100.0

TABLE 6

Most Commonly Used Short-Wave
Diathermy Devices

Manufacturer	Model	Number of Devices	% of Devices
Siemens	Ultratherm 608	465	33.4
Siemens	Ultratherm 303	112	8.0
Burdick	MF 490	106	7.6
Sterne	SB	93	6.7
Siemens	603	64	4.6

TABLE 7

Most Commonly Used Microwave
Diathermy Devices

Manufacturer	Model	Number of Devices	% of Devices
Siemens	Radiotherm 305	42	22.7
Burdick	MW 200	28	15.1
Siemens	306	21	11.3
Burdick	MW 225	18	9.7
Bosch	Radarmed 12T202	9	4.9

TABLE 8

Parts of the Body Treated by Short-Wave and Microwave Diathermy

Part of the body \ Facility		Hospital	Chiro-practic Clinic	Physio-therapy Clinic	Sport Medicine Clinic
	Extremities	325	162	94	31
	Upper trunk	317	152	96	30
	Lower trunk	322	158	97	30
Head	Musculo Skeletal System	38	9	9	
	Nervous System	5	1	2	
	T.M. Joint	14	1	8	
	Sinuses & Nasal Cavity	109	58	34	7
	Ears & Others	5	2		
	Other	4	4	1	
Pelvis	Reproduction System	31	2	13	
	Urinary System	6	3		
	Musculo Skeletal System	112	68	44	13
	Alimentary & Other	22	4	2	

TABLE 9

Mode and Duration of Treatment By
Short-Wave and Microwave Diathermy

Diathermy type	Short-wave		Microwave	
	Continuous	Pulsed	Continuous	Pulsed
Number of replies	1168	90	150	8
Mean exposure (min)	18.8	16.6	17.4	12.9
Max. exposure (min)	40	30	30	20
Min. exposure (min)	1	5	7	10
Standard deviation (min)	5	7	5	5

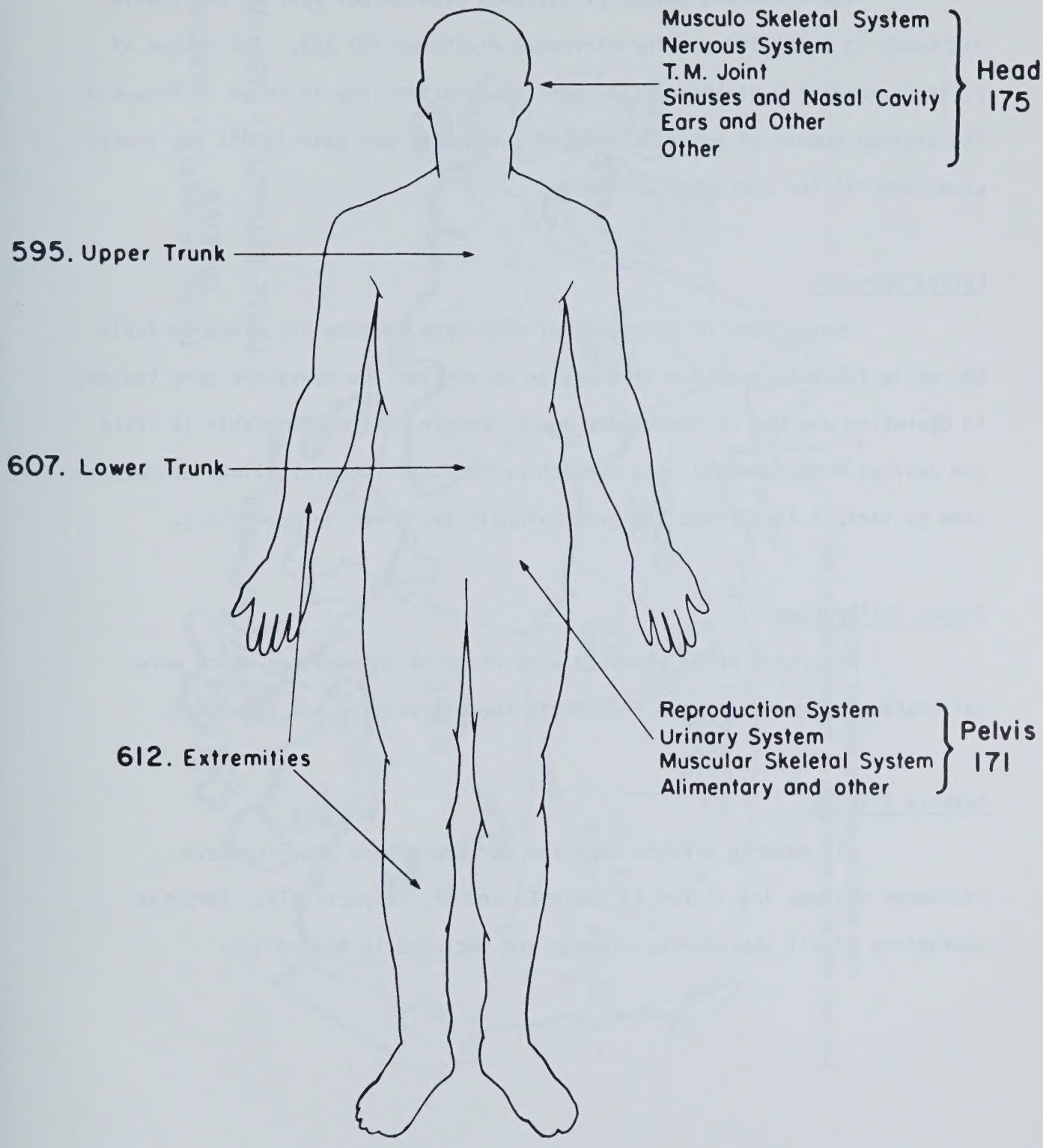

Fig. 4 parts of body treated by short wave and microwave diathermy devices with number of treatments reported

The estimated number of patients treated per year by short-wave diathermy is 1 380 188 and for microwave diathermy 137 162. The number of patients receiving diathermy treatment in each province is shown in Figure 5. The average number of patients treated per device per year is 991 for short-wave, and 741 for microwave diathermy.

Device Operator

Professions of operators of diathermy devices are given in Table 10, while Table 11 provides information on whether the operators were trained in operation and use of short-wave and microwave diathermy. Table 12 lists the devices most commonly used by each profession. Complete lists of devices used by various facilities and professionals are given in Appendix C.

Device Calibration

Figures 6 and 7 show the percentage of the devices which were calibrated, by whom, and how frequently the calibration was completed.

Adverse Effects

All adverse effects reported for short-wave and microwave diathermy devices are listed in Table 13 and 14, respectively. Verbatim quotations of all the adverse effects are enclosed in Appendix D.

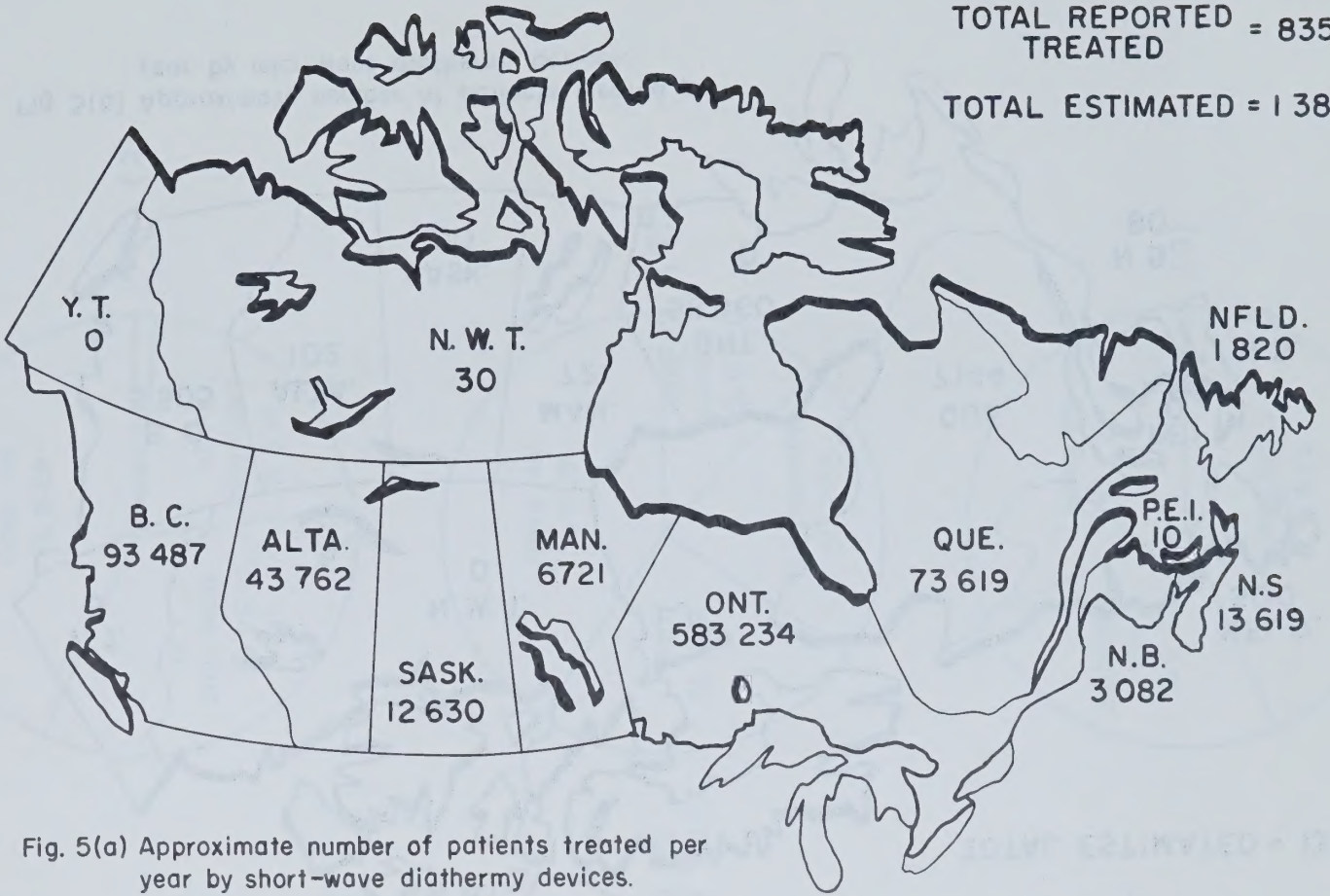

Fig. 5(a) Approximate number of patients treated per year by short-wave diathermy devices.

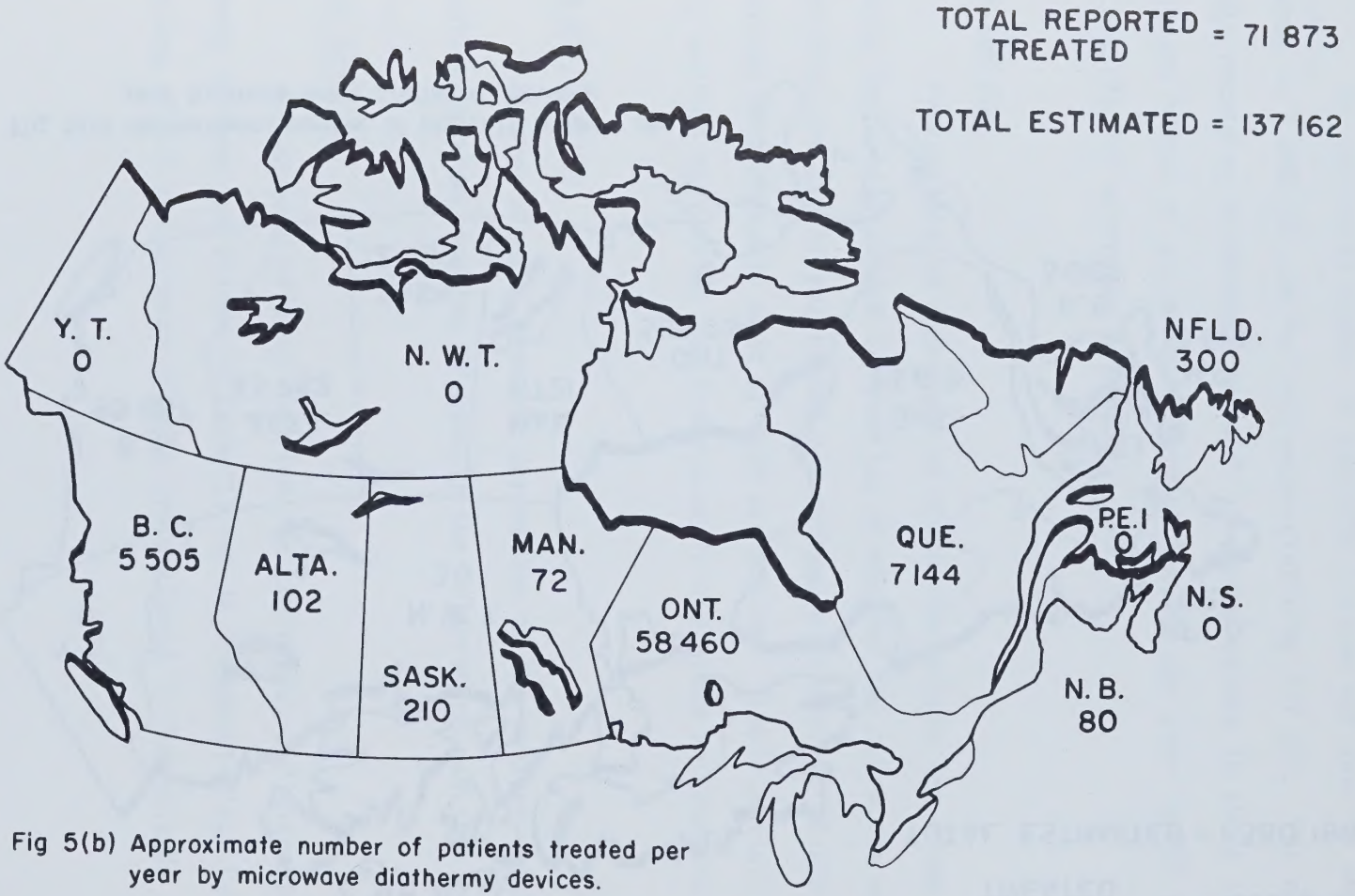

Fig 5(b) Approximate number of patients treated per year by microwave diathermy devices.

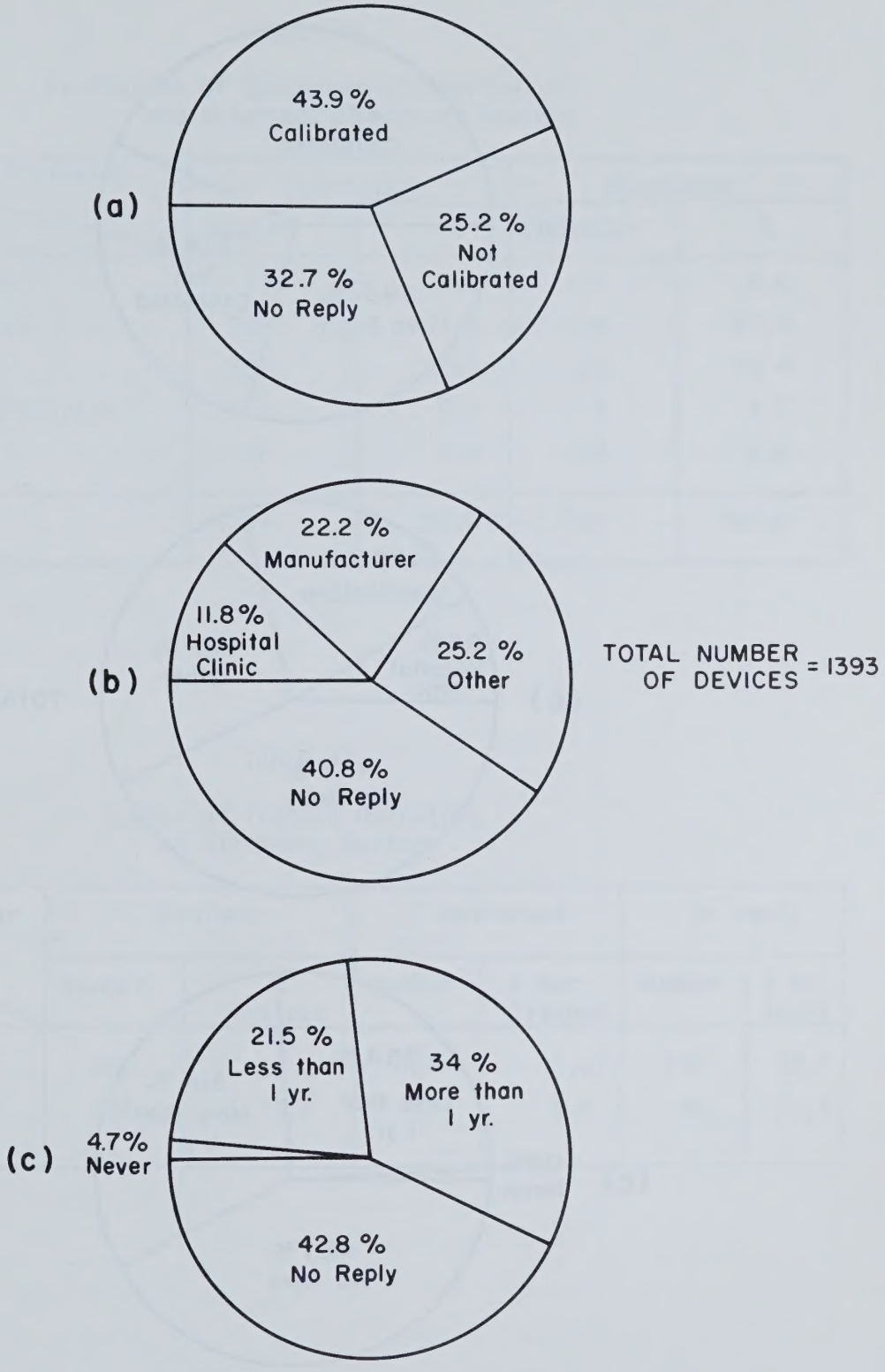

Fig. 6 Short-Wave Diathermy Devices:
(a) Percentage of calibrated devices; (b) Who calibrates the devices; (c) Frequency of calibration.

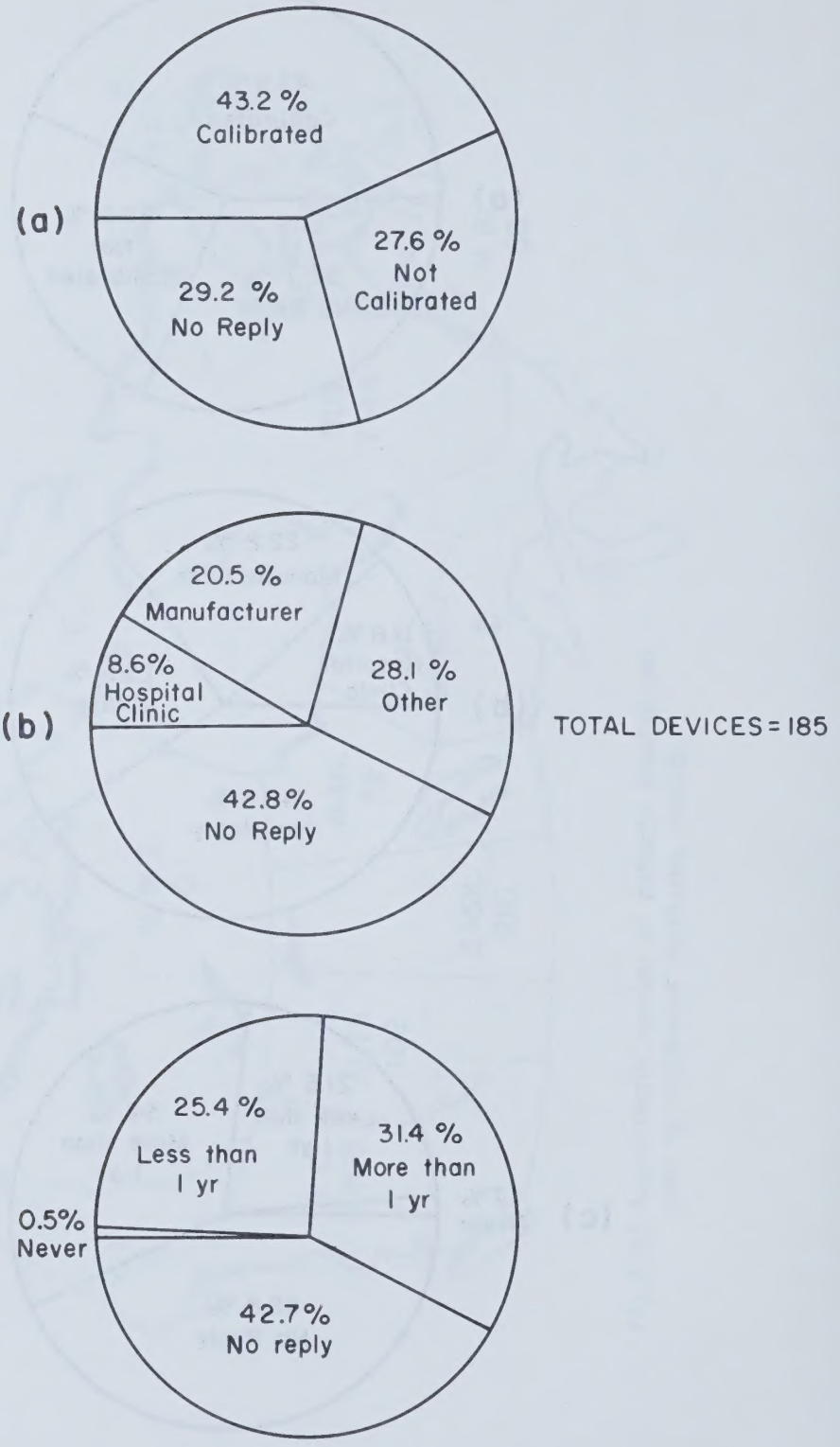

Fig. 7 Microwave Diathermy Devices:
(a) Percentage of calibrated devices; (b) Who calibrates the devices; (c) Frequency of calibration.

TABLE 10

Profession of Operators of Short-Wave and Microwave Diathermy Devices

Diathermy / Operator's Profession	Short-wave		Microwave	
	Number	%	Number	%
Medical Doctor	13	1.0	8	4.4
Physiotherapist	966	71.1	130	71.4
Chiropractor	282	20.7	28	15.4
Electronic Technician	6	0.4	4	2.2
Other	92	6.8	12	6.6
Total	1359	100.0	182	100.0

TABLE 11

Number of Trained Operators of Diathermy Devices

Operator / Type of Device	Trained		Untrained		No reply	
	Number	% Trained	Number	% Not Trained	Number	% No Reply
Short-Wave	756	54.3	101	7.3	536	38.5
Microwave	134	72.4	11	5.9	40	21.6

TABLE 12

Short-Wave and Microwave Devices Most Commonly Used by Various Professions

Profession	Short-Wave Diathermy			Microwave Diathermy		
	Device	No.	%	Device	No.	%
Medical Doctor	ValleyLab SSE2K	6	46.2	Birtcher 770	8	100
	Siemens 303	3	23			
	Total	9	69.2	Total	8	100
Physio-therapists	Siemens 608	408	42.2	Siemens 305	35	26.9
	Siemens 303	99	10.2	Burdick MW200	24	18.5
	Burdick MF490	85	8.8	Siemens 306	20	15.4
	Burdick MF49	51	5.3	Burdick MW225	13	10
	Siemens 603	49	5.1			
	Sterne SB	33	3.4			
	Total	725	75	Total	92	70.8
Chiropractors	Sterne SB	57	20.2	Fisher 10-A	4	14.3
	Diapulse D102	35	12.4	Siemens 305	3	10.7
	Smith & Reilly 400SP	29	10.2	Bosch Not Stated	3	10.7
	Mettler MT300	19	6.7			
	Sterne Not Stated	19	6.7			
	Total	159	56.2	Total	10	35.7
Technicians	Siemens 608	3	50	Siemens 305	2	50
				Burdick MW225	2	50
	Total	3	50	Total	4	100
Other	Siemens 608	41	44.6	Siemens 306	2	16.7
	Diapulse D102	11	12.0	Raytheon CMD13	2	16.7
	Siemens 603	7	7.6	Burdick MW200	2	16.7
	Burdick MF490	7	7.6	Bosch 12T201	2	16.7
	Sterne Not Stated	6	6.5			
	Total	72	78.3	Total	8	66.8

TABLE 13

Adverse Effects Reported For
Short-Wave Diathermy

Adverse Effect	Facility				Total
	Hospital	Chiropractor	Physiotherapy	Sport Clinic	
Pain/ Discomfort	18	2	3	1	24
Burns/Heat	5	5	2		12
Dizziness/ Nausea	6	1	1		8
Diarrhea			1		1
Swelling	1		1		2
Blurred Vision	1				1
Pacemaker Interference	1				1
Total	32	8	8	1	49

TABLE 14

Adverse Effects Reported For
Microwave Diathermy

Adverse Effect	Facility			Total
	Hospital	Chiropractor	Physiotherapy	
Pain/Discomfort	2		2	4
Burns	4	1		5
Swelling			1	1
Total	6	1	3	10

DISCUSSIONS

Number of devices

From the data collected (Figs. 1, 2, 3 and Tables 1, 2, 3) it is evident that a relatively small number of facilities (24%) use short-wave diathermy, and even fewer facilities (5.7%) use microwave diathermy. No use of radio-frequency or microwave blood warmers was reported. Some errors might have resulted from a lack of knowledge of the person completing the questionnaire, since two RF blood warmers have been located in one of the Ottawa hospitals.

A relatively large number of hospitals reported use of short-wave and microwave diathermy, but very few sport medicine clinics. In all facilities short-wave diathermy is more popular than microwave diathermy. The ratio is approx. 1:3 for hospitals; approx. 1:4 for physiotherapy clinics and sports medicine clinics, and 1:6 for chiropractic clinic in favour of the short-wave diathermy, (Figs. 1 and 3). Only in very few cases does a facility use microwave diathermy and not have short-wave diathermy as well (Fig. 3).

The regional distribution of the facilities using short-wave and microwave diathermy is not proportional to the population of each province (Fig. 2, Tables 1 and 2), since slightly more than a half of the facilities having diathermy devices are located in Ontario. The same is true for the actual number of devices themselves. The greatest number of facilities using short-wave diathermy on per capita basis is in Ontario and British Columbia, and using microwave diathermy in the Northwest Territories and Ontario. The

The average number of devices per facility is 2 for the short-wave and 1 for microwave diathermy (Table 2). No differences among the provinces can be noted.

More than 50% (53.9%, Table 3) of the short-wave and 63.8% of microwave diathermy devices are located in hospitals.

Manufacturers and types of devices

There were 34 manufacturers of short-wave diathermy in use in Canada in 1977, but 4 of these accounted for over 40% of models and over 85% of devices (Table 4). The Ultratherm 608 manufactured by Siemens was found to constitute 33.4% (Table 6) of the devices in use. Nearly half (48.5%) of short-wave devices were manufactured by Siemens, with Burdick following with 16.7% of the devices.

The two biggest manufacturers of short-wave diathermy, Siemens and Burdick, also dominate in microwave diathermy manufacture. Only 12 manufacturers of microwave diathermy were reported. The devices manufactured by Siemens account for 36.2%, and by Burdick for 30.3% of all devices reported. The most popular models are Siemens, Radiotherm 305 (22.7% of all devices) and Burdick, MW200 (15.1%) as shown in Table 7.

Treatment

The facilities which reported the use of short-wave and/or microwave diathermy indicated that extremities, upper trunk and lower trunk were most frequently treated. Approximately 600 positive replies were obtained

(Fig. 4, Table 8) for all facilities. There was no variation in the reply to this question for various facilities (Table 8). Slightly above 300 facilities reported using diathermy treatment for the head and pelvis.

Most frequently treatments for both types of diathermy involved continuous wave irradiation for 15 minutes. Since most models of diathermy operate in the continuous wave mode, it is not surprising that only 7% of the respondents indicated that they used pulsed short-wave diathermy, and 5% used pulsed microwave diathermy (Table 9). The average exposure duration and standard deviation did not vary substantially for the two types of treatment and two types of diathermy. The shortest average treatment duration was for pulsed microwave diathermy (12.9 min) and the longest (18.8 min) for continuous wave short-wave diathermy. Some of the replies appear to be in error, e.g., the minimum exposure duration for continuous short-wave treatment (1 min).

No meaningful data was obtained on the average power density nor the duty cycle in case of the pulsed radiation. This data is not easily available to the user of short-wave and microwave diathermy devices. The indicators on the devices usually specify total power delivered to the applicator in arbitrary units e.g., a dial scale from 0 to 100. The user manuals do not provide this information either. Only a limited number of respondents provided information on the frequency of operation of the diathermy devices. Thirty-two percent of the respondents who reported use of short-wave diathermy indicated the frequency of operation. For the devices, where the frequency was identified, 87% operated at 27.12MHz.

One model (Birtcher 800, 12 devices) operated at 13.56MHz. A few respondents confused the frequencies of operation for short-wave diathermy with those of microwave diathermy. Forty-one percent of the respondents identified the operation frequency for microwave diathermy. All microwave diathermy devices operated at 2.45GHz. Most of the respondents (78%) made a proper identification, the remaining confused microwave diathermy with short-wave.

The estimated number of patients treated was obtained by dividing the reported number of patients treated by the percentage of the respondents who supplied data on the number of patients treated and multiplying by 100, i.e.

$$\text{Estim. No. of patients} = \frac{\text{Reported number of patients} \times 100}{\%\text{ of reporting facilities}}$$

It was thus estimated that approximately 10 times as many patients were treated per year with short-wave diathermy as with microwave diathermy (1 380 188 vs. 137 162). The average number of patients treated per device was 991 for short-wave and 741 for microwave diathermy. However, this varies depending on the type of facility. In hospitals the average number of patients per device per year was 735, in chiropractic clinics 759, in physiotherapy clinics 1963 and in sports medicine clinics 1590 for short-wave diathermy. For microwave diathermy the average number of patients per device was 424 in hospitals, 746 in chiropractic clinics, 2071 in physiotherapy clinics and 577 in sport medicine clinics. The estimated number of treatments may be subject to a serious error because of the formulation of the question. For instance, a patient receiving 5 treatments might have been reported either as 1 or as 5.

Device operator and calibration

The survey indicated that a majority of short-wave (91.9%) and microwave (86.8%) diathermy devices is operated by physiotherapists and chiropractors (Table 10). More than a half (54.3%) of short-wave and 72.4% of microwave diathermy operators reported training in radio-frequency and microwave therapeutic techniques (Table 11). However, very little specific information regarding the type and duration of the training was obtained. Most frequently it was reported that the training was obtained during a physiotherapy or chiropractic course.

It is interesting to note that in most cases, chiropractors used different models of short-wave diathermy and some different models of microwave diathermy than other professions (Table 12).

Only about 70% of the respondents indicated if the devices were calibrated. Of these approximately 43% were actually calibrated (Figs. 6 and 7). The calibration was most frequently done by the manufacturer, and about one-third of the devices were calibrated more frequently than once a year. (Only about 60% of the respondents gave an answer to this question).

Adverse Effects

Few adverse effects were reported for both types of diathermy (Tables 13 and 14), and most of these were generally minor and reversible, such as pain or discomfort. Out of a total of 618 facilities using short-wave diathermy, 49 adverse effects were reported (about 8%). Only

10 adverse effects due to microwave diathermy treatment were reported by 148 facilities (about 7%). A few cases reported for short-wave diathermy, such as dizziness/nausea (8 cases), diarrhea (1 case) and blurred vision (1 case) appear to be of more serious consequences.

CONCLUSIONS

This survey provided data on the number and types of shortwave diathermy devices in Canada, their regional distribution, the number of patients treated per year, operator training and device calibration. Information was also obtained on treatment parameters such as the anatomical area treated, frequency and duration of treatment and the mode of operation (continuous or pulsed).

The survey showed extensive use of shortwave diathermy devices. In 1977, 1 380 000 patients were treated, ten times the number treated by microwave diathermy devices in that year. Guidelines for the safe use, design, construction and functioning of microwave diathermy devices have already been published by the Health Protection Branch (May 1980).

A further study to assess the potential health hazards of shortwave diathermy devices is indicated. If health hazards are identified, the data from this survey will be invaluable in the production of guidelines or regulations.

APPENDIX A

Survey Form

STATISTICS CANADA

HEALTH AND WELFARE CANADA

SURVEY OF RADIO FREQUENCY AND MICROWAVE MEDICAL APPLICATIONS

Is the name and address label correct? Yes [001] No [002] [003]

If "No", please provide correct information below:

Name	Address	Postal Code

1. Does your institution/clinic use radio frequency and/or blood warmers? Yes [004] No [005]
If "Yes", specify in which medical services:

Neurosurgery [006] Orthopedic Surgery [007] Gynaecology [008] General Surgery [009] Cardiovascular Surgery [010] Emergency [011] Other [012] (specify) _____ [013]

2. Does your institution/clinic provide therapeutic radio frequency (shortwave) and/or microwave services? Yes [014] No [015]
If "Yes", specify what parts of the body are treated:

Extremities [016] Upper trunk [017] Lower trunk [018] Head [019] (specify) _____ [020] Pelvic Region [021] (specify) _____ [022]

3. The following questions apply to radio frequency and microwave equipment used as blood warmers and/or for therapeutic (shortwave and microwave) purposes in the institution/clinic:

	Manufacturer	Model Number	Number of units of each model	Approximate number of units of blood warmed or patients treated per year	Per treatment, continuous wave: Duration (minutes)	Per treatment, continuous wave: Average Exposure (mW/cm²)	Per treatment, pulsed mode: Duration (minutes)	Per treatment, pulsed mode: Average Exposure (mW/cm²)	Per treatment, pulsed mode: Duty cycle (%)	Applicators (transducers, when applicable): Manufacturer	Applicators (transducers, when applicable): Model Number	Applicators (transducers, when applicable): Frequency (M. Hz.)	Profession of each operator of equipment or instruments (please provide number of operators): Medical doctor	Physiotherapist	Chiropractor	Qualified electronic tech.	Other (specify)	Are the operators trained in microwave? Yes (see Question 4)	No	Is the equipment regularly calibrated? Yes	No	If "Yes", by whom: Hospital/clinic	Manufacturer	Other	If "Yes", How frequently? Never	Less than once a year	More than once a year	Adverse effects due to radio frequency or microwave treatment or transfusion of warmed blood? Yes (see Question 5)	No
Blood warmers	[026]	[027]	028	029	030	031	032	033	034	[035]	[036]	037	038	039	040	041	[042]	043	044	045	046	047	048	049	050	051	052	053	054
a.	[055]	[056]	057	058	059	060	061	062	063	[064]	[065]	066	067	068	069	070	[071]	072	073	074	075	076	077	078	079	080	081	082	083
b.	[084]	[085]	086	087	088	089	090	091	092	[093]	[094]	095	096	097	098	099	[100]	101	102	103	104	105	106	107	108	109	110	111	112
c.	[113]	[114]	115	116	117	118	119	120	121	[122]	[123]	124	125	126	127	128	[129]	130	131	132	133	134	135	136	137	138	139	140	141
d.	[142]	[143]	144	145	146	147	148	149	150	[151]	[152]	153	154	155	156	157	[158]	159	160	161	162	163	164	165	166	167	168	169	170
Therapeutic (shortwave) Applications a.	[171]	[172]	173	174	175	176	177	178	179	[180]	[181]	182	183	184	185	186	[187]	188	189	190	191	192	193	194	195	196	197	198	199
b.	[200]	[201]	202	203	204	205	206	207	208	[209]	[210]	211	212	213	214	215	[216]	217	218	219	220	221	222	223	224	225	226	227	228
c.	[229]	[230]	231	232	233	234	235	236	237	[238]	[239]	240	241	242	243	244	[245]	246	247	248	249	250	251	252	253	254	255	256	257
Therapeutic (microwave) Applications a.	[258]	[259]	260	261	262	263	264	265	266	[267]	[268]	269	270	271	272	273	[274]	275	276	277	278	279	280	281	282	283	284	285	286
b.	[287]	[288]	289	290	291	292	293	294	295	[296]	[297]	298	299	300	301	302	[303]	304	305	306	307	308	309	310	311	312	313	314	315
c.	[316]	[317]	318	319	320	321	322	323	324	[325]	[326]	327	328	329	330	331	[332]	333	334	335	336	337	338	339	340	341	342	343	344
d.																													

4. If operators are trained in radio frequency and microwave, please provide description, location and duration of the course: _____ [345]

5. If adverse effects were observed due to radio frequency and/or microwave treatment or due to transfusion of warmed blood, please describe: _____ [346]

Name of person completing questionnaire _____ Title _____ Date _____ (Area Code) Telephone No. _____

APPENDIX B

Manufacturers and Models of Short-Wave and Microwave Diathermy Devices

SHORT WAVE DEVICES

Manufacturer	Models	Number of Devices
Advanced Trends	7050 B	1
American Cytoscope	VC 400	1
Amrex	316-EC	1
Amrex	Not Stated	1
Birtcher	505	21
Birtcher	850	5
Birtcher	860	3
Birtcher	Crusader 875	4
Birtcher	Crystal Bandmaster 800	35
Birtcher	Not Stated	2
Bosch	12S	1
Bosch	12 S 201	4
Bosch	12 S 231	2
Bosch	Not Stated	4
Burdick	505	1
Burdick	700	1
Burdick	702	1
Burdick	D-900	20
Burdick	D/600	1
Burdick	D 507	3
Burdick	D 54	12
Burdick	MF 410	1
Burdick	MF 49	60
Burdick	MF 490	106
Burdick	Microtherm 2547	1
Burdick	Not Stated	11
Burdick	X 85	14

Manufacturer	Models	Number of Devices
Dallons	1600 A	10
Diapulse	D 101	13
Diapulse	D 102	46
Diapulse	Not Stated	6
E.E. Erbe	94	1
E.E. Erbe	Erbotherm 12-230	2
E.E. Erbe	Not Stated	1
Electrodyne	M	2
Elmed	301	1
Ems	50 L	1
Ems	Mark III	1
Ems	Megatherm Senior 6	5
Fenwac Thermolyne	4R4-302	1
Ferranti	SW 227	2
Fischer	M-11	1
Fischer	Not Stated	1
Fisher	1200	1
Fisher	1500	1
Fisher	1800 A	1
Fisher	400	7
Garfield	G-50	3
Garfield	Not Stated	2
General Electric	E	2
General Electric	F Type 2	1
Huttinger	Not Stated	4
Int. Medical Elect.	D 603	1
ITO	KGS	3
ITO	KUS-3	1
Liebel Florsheim	SW 227	5

Manufacturer	Models	Number of Devices
Majestic	M 100	3
Majestic	M 200	2
Martin	30	2
Martin	Gematherm 301	18
Martin	Not Stated	3
Mettler	158 N 33	1
Mettler	160 N 33	1
Mettler	161 N 33	1
Mettler	165 H 63	2
Mettler	186 H 24	1
Mettler	Autotherm ME 300	30
Myofasciatron	R 13	3
Nemectrodyne	8	2
Neomed	3000	1
Neomed	3001	1
Raytheon	606	1
Raytheon	CMD 8	12
Sanitex	300 A	1
Siemens	300	1
Siemens	404	1
Siemens	514	2
Siemens	525	3
Siemens	603	64
Siemens	604	2
Siemens	606	8
Siemens	688	1
Siemens	Not Stated	16
Siemens	Ultratherm 303	112
Siemens	Ultratherm 608	465
Smith & Reilly	108	1
Smith & Reilly	400-88	1
Smith & Reilly	400 SP	30

Manufacturer	Models	Number of Devices
Smith & Reilly	468 SC	1
Smith & Reilly	400 SC	3
Sterne	11	1
Sterne	3	10
Sterne	321	1
Sterne	93	1
Sterne	Not Stated	20
Sterne	SB	93
Sterne	SBP	22
Valley Lab	SSE 2 K	6

MICROWAVE DEVICES

Manufacturer	Model	Number of Devices
Birtcher	770	8
Birtcher	Not Stated	2
Bosch	Not Stated	3
Bosch	PTB	2
Bosch	PTB 11	1
Bosch	Radarmed	4
Bosch	Radarmed 12 T 201	6
Bosch	Radarmed 12 T 202	9
Bosch	Radarmed PT 11	1
Burdick	D 560	1
Burdick	MW 1	5
Burdick	MW 200	28
Burdick	MW 225	18
Burdick	Not Stated	4
Elmed	Sono Dynator	2
Fisher	10-A	4
Ivey	3051	1
Microtron	MT 130	1
Picker	Not Stated	1
Raytheon	306	1
Raytheon	CMD 13	5
Raytheon	CMD 7	1
Raytheon	CMD 8	5
Raytheon	Not Stated	1
Siemens	306	21
Siemens	405	1
Siemens	FTZ	1
Siemens	Not Stated	2
Siemens	Radiotherm 305	42
Sterne	Not Stated	3
Teca	S-11	1

APPENDIX C

Listings of

Short-Wave and Microwave

Diathermy Devices;

Use by Profession

and Facility Type

Table C1 Short-wave Diathermy; use by various professionals, (total number of facilities 1284).

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Amer. Cytoscope	VC 400			1	100							1	.1
Amrex	316 EC					1	100					1	.1
Amrex	Not Stated					1	100					1	.1
Birtcher	505			13	68.4	6	31.6			1	5.3	19	1.5
Birtcher	850			4	80	1	20	1	20			5	.4
Birtcher	800			30	88.2	3	8.8			1	2.9	34	2.6
Birtcher	860			2	66.7	1	33.3					3	.2
Birtcher	Not Stated			1	50	1	50					2	.2
Bosch	12 S			1	100							1	.1
Bosch	12 S 201			2	100							2	.2
Bosch	12 S 231			1	100							1	.1
Bosch	12 T 201			3	100							3	.2
Bosch	Not Stated			2	50	2	50					4	.3
Burdick	505					1	100					1	.1
Burdick	700			1	100							1	.1
Burdick	702			1	100							1	.1

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Burdick	D900			19	100							19	1.5
Burdick	D-600			1	100					1	100		
Burdick	D 507			1	33.3	2	66.7					3	.2
Burdick	D 54			12	100.0					1	8.3	12	.9
Burdick	MF 410			1	100							1	.1
Burdick	MF 49			51	91.1	4	7.1	1	1.8	1	1.8	56	4.4
Burdick	MF 490			85	94.4	4	4.4			7	7.8	90	7.0
Burdick	2547			1	100							1	.1
Burdick	X 85			11	78.6	3	21.4					14	1.1
Burdick	Not Stated			10	100							10	.8
Dallons	1600 A			8	88.9	1	11.1					9	.7
Diapulse	D 101			4	30.8	9	69.2					13	1
Diapulse	D 102			2	5.3	35	92.1			11	28.9	38	3
Diapulse	Not Stated					5	100					5	.4
EE Erbe	94			1	100					1	100	1	.1
EE Erbe	12-230			1	100	1	100					1	.1
EE Erbe	Not Stated			1	100							1	.1
Electrodyne	M					1	100					1	.1
Elmed	301			1	100							1	.1

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
EMS	50 L			1	100							1	.1
EMS	Mark III			1	100							1	.1
EMS	Megatherm Sr. 6			5	100							5	.4
Fenwac	4R4-302	1	100									1	.1
Ferranti	SW 277			1	50	1	50					2	.2
Fischer	M-11					1	100					1	.1
Fischer	Not Stated			1	100							1	.1
Fisher	1500					1	100					1	.1
Fisher	1800 A					1	100					1	.1
Fisher	400			3	42.9	4	57.1					7	.5
Garfield	G 50					3	100					3	.2
Garfield	Not Stated			2	100							2	.2
General Electric	E			2	100							2	.2
Huttinger	Not Stated			2	50	2	50					4	.3
INT.MED.ELECT.	D 603					1	100					1	.1
ITO	KGS					3	100					3	.2
ITO	KUS-3					1	100					1	.1
Liebel Floasheim	227			3	60	2	40					5	.4

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Martin	30			2	100							2	.2
Martin	Gematherm 301			14	100							14	1.1
Martin	Not Stated			3	100							3	.2
Mettler	Autotherm ME 300			10	34.5	19	62.5			1	3.4	29	2.3
Mettler	165 H 63					2	100					2	.2
Myofascitron	R 13					3	100					3	.2
Nemectrodyne						1	100					1	.1
Neomed	3000	1	100									1	.1
Neomed	3001	1	100									1	.1
Raytheon	CMD 8			6	54.5	5	45.5			1	9.1	11	.9
Raytheon	606			1	100							1	.1
Sanitex	300 A			1	100							1	.1
Siemens	404			1	100							1	.1
Siemens	514					2	100					2	.2
Siemens	525			2	66.7	1	33.3			1	33.3	3	.2
Siemens	603			49	84.5	6	10.3			7	12.1	58	4.5
Siemens	604					1	100					1	.1
Siemens	606	1	16.7	4	66.7	1	16.7			1	16.7	6	.5

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Siemens	688			1	100			1	100			1	.1
Siemens	Not Stated			12	75.0	4	25.0					16	1.2
Siemens	Ultratherm 303	3	2.9	99	94.3	3	2.9			5	4.8	105	8.2
Siemens	Ultratherm 608			408	93.4	12	2.7	3	.7	41	9.4	437	34
Smith & Reilly	108					3	100					1	.1
Smith & Reilly	40088					1	100					1	.1
Smith & Reilly	400 SP			1	3.3	29	96.7			2	6.7	30	2.3
Smith & Reilly	468 SC					1	100					1	.1
Smith & Reilly	400 SC					3	100			1	33.3	3	.2
Sterne	3			10	100							10	.8
Sterne	321					1	100					1	.1
Sterne	93					1	100					1	.1
Sterne	SB			33	36.7	57	63.3			2	2.2	90	7
Sterne	SBP			15	68.2	7	31.8					22	1.7
Sterne	Not Stated			1	5.0	19	95			6	30	20	1.6
Valley Lab	SSE 2 K	6	100									6	.5
Column Total & %		13	1.0	966	75.2	282	22.0	6	.5	92	7.2	1284	100

Table C2 Short-wave Diathermy; use by various professionals in hospitals, (total number of hospitals 688).

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Birtcher	505			9	100					1	11.1	9	1.3
Birtcher	800			23	100							1	.1
Birtcher	850			4	100							4	.6
Birtcher	860			1	100							1	.1
Birtcher	Not Stated			1	100							1	.1
Burdick	D 54			4	100							4	.6
Burdick	D 507			1	100							1	.1
Burdick	D-600			1	100					1	100	1	.1
Burdick	D-900			17	100							17	2.5
Burdick	MF 49			30	96.8					1	3.2	31	4.5
Burdick	MF 490			65	98.5					5	7.6	66	9.6
Burdick	MF 410			1	100							1	.1
Burdick	X 85			5	100							5	.7
Burdick	Not Stated			4	100							4	.6

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Dallons	1600 A			3	100							3	.4
Diapulse	D 102			1	100							1	.1
EE Erbe	94			1	100					1	100	1	.1
EMS	Mark III			1	100							1	.1
EMS	Megatherm Sr. 6			4	100							4	.6
Fenwac	4R4-302	1	100									1	.1
Ferranti	SW 277			1	100							1	.1
General Electric	E			2	100							2	.3
Huttinger	Not Stated			1	100							1	.1
Liebel Flor-sheim	227			2	100							2	.3
Martin	Gematherm 301			8	100							8	1.2
Martin	Not Stated			3	100							3	.4
Mettler	Auto ME 300			5	100							5	.7
Neomed	3000	1	100									1	.1
Neomed	3001	1	100									1	.1
Raytheon	CMD 8			2	100							2	.3

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Siemens	Ultratherm 303	3	4.5	64	95.5					5	7.5	67	9.7
Siemens	525			1	100							1	.1
Siemens	603			38	92.7					7	17.1	41	6.0
Siemens	606	1	50.0	1	50.0					1	50.0	2	.3
Siemens	Ultratherm 608			333	95.1			3	.9	39	11.1	350	50.9
Siemens	688			1	100			1	100			1	.1
Siemens	Not Stated			11	100							11	1.6
Sterne	SB			3	100							3	.4
Sterne	Not Stated			1	100							1	.1
Valley Lab	SSE 2 K	6	100									6	.9
Column Total & %		13	1.9	653	94.9			4	.6	61	8.9	688	100

Table C3 Short-wave Diathermy; use by various professionals in chiropractic clinics (total number of clinics 288).

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Amer. Cytoscope	VC 400			1	100							1	.3
Amrex	316-EC					1	100					1	.3
Amrex	Not Stated					1	100					1	.3
Birtcher	800					3	100					3	1.0
Birtcher	850					1	100	1	100			1	.3
Birtcher	860					1	100					1	.3
Birtcher	Not Stated					1	100					1	.3
Birtcher	505					6	100					6	2.1
Bosch	Not Stated					2	100					2	.7
Burdick	505					1	100					1	.3
Burdick	D 507					2	100					2	.7
Burdick	MF 49			2	33.3	4	66.7	1	16.7			6	2.1
Burdick	MF 490					4	100					4	1.4
Burdick	X 85					3	100					3	1.0
Dallons	1600 A					1	100					1	.3
Diapulse	D 101					9	100					9	3.1
Diapulse	D 102			1	2.7	35	94.6			11	29.7	37	12.8
Diapulse	Not Stated					5	100					5	1.7

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Electrodyne	M					1	100					1	.3
EE Erbe	12-230			1	100	1	100					1	.3
Ferranti	SW 227					1	100					1	.3
Fisher	M-11					1	100					1	.3
Fisher	400					4	100					4	1.4
Fisher	1500					1	100					1	.3
Fisher	1800 A					1	100					1	.3
Garfield	G 50					3	100					3	1.0
Huttinger	Not Stated					2	100					2	.7
Int.Med.Elect.	D 603					1	100					1	.3
ITO	K 65					3	100					3	1.0
ITO	KUS-3					1	100					1	.3
Liebel Florsheim	227					2	100					2	.7
Mettler	Auto ME 300					19	100			1	5.3	19	6.6
Mettler	165 H 63					2	100					2	.7
Myofasciatron	R 13					3	100					3	1.0
Nemectrodyne	8					1	100					1	.3
Raytheon	CMD 8					5	100			1	20	5	1.7

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Siemens	Ultratherm 303					3	100					3	1.0
Siemens	514					2	100					2	.7
Siemens	525					1	100			1	100	1	.3
Siemens	603					6	100					6	2.1
Siemens	604					1	100					1	.3
Siemens	606					1	100					1	.3
Siemens	Ultratherm 608					12	100			1	8.3	12	4.2
Siemens	Not Stated					4	100					4	1.4
Smith & Reilly	108					1	100					1	.3
Smith & Reilly	400 SC					3	100			1	33.3	3	1.0
Smith & Reilly	400 SP					29	100			2	6.9	9	10.1
Smith & Reilly	468 SC					1	100					1	.3
Smith & Reilly	40088					1	100					1	.3
Sterne	SB			1	1.7	57	98.3			2	3.4	58	20.1
Sterne	SBP					7	100					7	2.4
Sterne	93					1	100					1	.3
Sterne	321					1	100					1	.3
Sterne	Not Stated					19	100			6	31.6	19	6.6
Column Total & %				6	2.1	282	97.9	2	.7	26	9.0	288	100

Table C4 Short-wave Diathermy; use by various professionals in physiotherapy clinics (total number of clinics 234)

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Birtcher	505			4	100							4	1.7
Birtcher	800			2	100							2	.9
Birtcher	875			1	100							1	.4
Bosch	12 S			1	100							1	.4
Bosch	125201			2	100							2	.9
Bosch	Not Stated			2	100							2	.9
Burdick	D 54			6	100							6	2.6
Burdick	MF 49			18	100							18	7.7
Burdick	MF 490			16	100					2	12.5	16	6.8
Burdick	700			1	100							1	.4
Burdick	702			1	100							1	.4
Burdick	X 85			6	100							6	2.6
Burdick	Not Stated			4	100							4	1.7
Dallons	1600 A			4	100							4	1.7
Diapulse	D 101			4	100							4	1.7
EE Erbe	Not Stated			1	100							1	.4
Elmed	301			1	100							1	.4
EMS	50 L			1	100							1	.4
Fischer	Not Stated			1	100							1	.4

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Fisher	400			3	100							3	1.3
Garfield	Not Stated			2	100							2	.9
Huttinger	Not Stated			1	100							1	.4
Liebel Florsheim	227			1	100							1	.4
Martin	30			1	100							1	.4
Martin	Gematherm 301			6	100							6	2.6
Mettler	Auto ME 300			2	100							2	.9
Raytheon	CMD 8			4	100							4	1.7
Sanitex	300 A			1	100							1	.4
Siemens	Ultratherm 303			30	100							30	12.8
Siemens	404			1	100							1	.4
Siemens	525			1	100							1	.4
Siemens	603			4	100							4	1.7
Siemens	606			2	100							2	.9
Siemens	Ultratherm 608			54	100							54	23.1
Siemens	Not Stated			1	100							1	.4
Smith & Reilly	400 SP			1	100							1	.4

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Sterne	3			10	100							10	4.3
Sterne	SB			28	100							28	12.
Sterne	SBP			5	100							5	2.1
Column Total & %				234	100					2	0.9	234	100

Table C5 Short-wave Diathermy; use by Various Professionals in Sports Clinics (total number of clinics 74).

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Birtcher	800			5	100					1	100	6	8.1
Birtcher	860			1	100							1	1.4
Birtcher	875			2	100							2	2.7
Bosch	12S231			1	100							1	1.4
Burdick	D 54			2	100					1	100	2	2.7
Burdick	D-900			2	100							2	2.7
Burdick	MF 49			1	100							1	1.4
Burdick	MF 490			4	100							4	5.4
Burdick	2547			1	100							1	1.4
Burdick	Not Stated			2	100							2	2.7
Dallons	1600 A			1	100							1	1.4
EMS	Megatherm S Sr. 6			1	100							1	1.4
Martin	30			1	100							1	1.4
Mettler	Auto ME 300			3	100							3	4.1
Raytheon	606			1	100							1	1.4

DEVICE		PROFESSION										Row Total	
		MD		PHYSIO		CHIRO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Siemens	Ultratherm 303			5	100							5	6.8
Siemens	603			7	100							7	9.5
Siemens	606			1	100							1	1.4
Siemens	Ultratherm 608 H			21	100					1	4.8	21	28.4
Sterne	SB			1	100							1	1.4
Sterne	SBP			10	100							10	13.5
Column Total & %				73	100					3	2.1	74	100

Table C6 Microwave Diathermy; use by various professionals (total number of facilities 167)

DEVICE		PROFESSION										ROW TOTAL	
		MD		PHYSIO		CHIRO		TECH		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Birtcher	770	8	100									8	4.8
Birtcher	Not Stated					1	100					1	0.6
Bosch	Not Stated					3	100					3	1.8
Bosch	PTB			1	50	1	50					2	1.2
Bosch	PTB 11					1	100					1	0.6
Bosch	Radarmed			3	100							3	1.8
Bosch	Radarmed 12T201			5	83.3	1	16.7			2	33.3	6	3.6
Bosch	Radarmed 12T202			8	100							8	4.8
Bosch	Radarmed PT 11			1	100							1	0.6
Burdick	D 560			1	100							1	0.6
Burdick	MW 1			3	60	2	40					5	3.0
Burdick	MW 200			24	100			2	8.3	2	8.3	24	14.4
Burdick	MW 225			13	86.7	2	13.3			1	6.7	15	9.0
Burdick	Not Stated					2	100					2	1.2
Elmed	Sono Dynator			2	100							2	1.2
Fisher	10-A					4	100					4	2.4
Ivey	3051			1	100							1	0.6
Microtron	MT 130					1	100					1	0.6

DEVICE		PROFESSION										ROW TOTAL	
		MD		PHYSIO		CHIRO		TECH		OTHER			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%	No	%
Picker	Not Stated					1	100					1	0.6
Raytheon	306			1	100							1	0.6
Raytheon	CMD 13			3	60	2	40			2	40	5	3.0
Raytheon	CMD 7			1	100							1	0.6
Raytheon	CMD 8			4	80	1	20					5	3.0
Raytheon	Not Stated			1	100							1	0.6
Siemens	306			20	95.2					2	9.5	21	12.6
Siemens	405					1	100					1	0.6
Siemens	Not Stated			2	100					1	50	2	1.2
Siemens	Radiotherm 305			35	92.1	3	7.9	2	5.3	1	2.6	38	22.8
Stelne	Not Stated					2	100					2	1.2
Teca	S-11			1	100							1	0.6
Column Total & %		8	4.8	130	77.8	28	16.8	4	2.4	12	7.2	167	100

Table C7 Microwave Diathermy, use by various professionals in hospitals (total number of hospitals 107).

DEVICE		PROFESSION								Row Total	
		MD		PHYSIO		TECH.		OTHERS			
Manufacturer	Model	No	%	No	%	No	%	No	%	No	%
Birtcher	770	8	100	0	0					8	7.5
Bosch	PTB			1	100					1	0.9
Bosch	PTB 11			1	100					1	0.9
Bosch	Rad Med			1	100					1	0.9
Bosch	Rad Med 12 T 202			2	100					2	1.9
Bosch	12 T 201			3	100			2	66.7	3	2.8
Burdick	D 560			1	100					1	0.9
Burdick	MW 1			3	100					3	2.8
Burdick	MW 200			20	100	2	10.0	2	10.0	20	18.7
Burdick	MW 225			13	100			1	7.7	13	12.1
Raytheon	CMD 8			2	100					2	1.9
Raytheon	CMD 13			2	100			1	50.0	2	1.9
Raytheon	Not Stated			1	100					1	0.9
Siemens	Radiotherm 305			29	100	2	6.9	1	3.4	29	27.1
Siemens	306			18	100			1	5.6	18	16.8
Siemens	Not Stated			2	100			1	50.0	2	1.9
Column Total & %		8	7.5	99	92.5	4	3.7	9	8.4	107	100

Table C8 Microwave Diathermy; use by various professionals in chiropractic clinics.

DEVICE		PROFESSION				ROW TOTAL	
Manufacturer	Model	CHIRO		OTHER			
		NO	%	NO	%	NO	%
Birtcher	Not Stated	1	100			1	3.6
Bosch	PTB	1	100			1	3.6
Bosch	Rad Med PT 11	1	100			1	3.6
Bosch	Rad Med 12 T 201	1	100			1	3.6
Bosch	Not Stated	3	100			3	10.7
Burdick	MW 1	2	100			2	7.1
Burdick	MW 225	2	100			2	7.1
Burdick	Not Stated	2	100			2	7.1
Fisher	10-A	4	100			4	14.3
Microtron	MT 120	1	100	1	100	1	3.6
Picker	Not Stated	1	100			1	3.6
Raytheon	CMD 8	1	100			1	3.6
Raytheon	CMD 13	2	100	1	50.0	2	7.1
Siemens	Radiotherm 305	3	100			3	10.7
Siemens	405	1	100			1	3.6
Sterne	Not Stated	2	100			2	7.1
Column Total & %		28	100	2	7.1	28	100

Table C9 Microwave Diathermy; Use by Various Professionals in Physiotherapy Clinics.

DEVICE		PROFESSION		ROW TOTAL	
		PHYSIO.			
Manufacturer	Model	No	%	No	%
Bosch	Rad.Med.	2	100	2	9.1
Bosch	Rad.Med. 12T201	2	100	2	9.1
Bosch	Rad.Med. 12T202	6	100	6	27.3
Burdick	MW 200	2	100	2	9.1
Raytheon	CMD 7	1	100	1	4.5
Raytheon	CMD 8	2	100	2	9.1
Raytheon	CMD 13	1	100	1	4.5
Raytheon	306	1	100	1	4.5
Siemens	Radiotherm 305	4	100	4	18.2
Siemens	306	1	100	1	4.5
Column Total & %		22	100	22	100

Table C10 Microwave Diathermy; Use by Various Professionals in Sports Clinics (Total Number of Clinics 9).

DEVICE		PROFESSION				ROW TOTAL	
		PHYSIO		Other			
Manufacturer	Model	No	%	No	%	No	%
Burdick	MW 200	2	100			2	22.2
Elmed	Sono Dynator	2	100			2	22.2
Ivey	3051	1	100			1	11.1
Siemens	Radiotherm 305	2	100			2	22.2
Siemens	306	1	50	1	50	1	11.1
Teca	S-11	1	100			1	11.1
Column Total & %		9	180	1	50	9	100

APPENDIX D

Adverse Effects -

Short-Wave and Microwave Diathermy

Form	Device	Effect
12 0102	Burdick D-900	Discomfort of patients increased on several occasions when the short-wave diathermy was applied for un-diagnosed low back pain.
12 0114	Burdick D-900	Occasionally patients complain of increase in pain after treatment.
12 0124	Siemens 608-H	Sometimes pain over bony prominances, especially shoulder & ankle, occa-sional dizziness after treatment.
12 0138	Burdick MF-490	Nausea and ↑ pain.
13 0207	Siemens 303	Following S.W.D. treatment one patient experienced blurred vision and symptoms similar to earlier experienced radi-ation poisoning. These continued for 3 consecutive times and she discon-tinued.
24 0406	Siemens 303 " 608 Burdick MF 890 " MW 200 Birtcher 800	Brûlure superficelle occasionnelle
24 0433	Burdick MW 200	Les effets nocifs peuvant se produire avec la diathermie sont une brûlure profonde mais cela ne s'est jamais produit dans notre service.
24 0493	Siemens 608	Occasional increase in pain in some patients with shoulder conditions.
24 0507	Brudick MW 200 Siemens 608 H	Etoursiddements lors d'une application a la région cervicale.
24 0559	Siemens 608	Pendant les derniers cinq ans et demi, nous avons en une brûlure au 3° degré par l'application negligent d'un Interne.
35 0024	Siemens 305	One burn due to carelessness, now good recovery - No Sears
35 0037 1	Sterne SB Liebel Florsheim	Approximately 5 minor cutaneous burns in 18 years of practice.
35 0060 2	Siemens 608 " 603	A rare burn due to patient carelessness, occasional dizziness, occasional heart palpitations.

Form	Device	Effects
35 0061 2	Sterne SB	Increased discomfort when in acute stage of disorder.
35 0072 2	Siemens 608 Bosch Radarmed	↑Pain, swelling.
35 0087 2	Bosch Radarmed Siemens 608	Occasional problems if lack of knowledge of patient's history.
35 0137 1	Smith Reilley 400SP Sterne SB Mettler 300	Rare, mild burns to skin
35 0241 1	Sterne SB	1-3x/yr. ↑ symptoms ie (pain)
35 0242 1	Sterne SB	1-2x/yr. ↑ symptoms due to heat.
35 0309 1	Siemens 608 H Siemens 303	Short-wave burns are the greatest danger- patients are supplied with emergency shut-offs and warning buzzers and lit- erature. Some patients cannot tolerate the increased heat and of course it should never be applied to patients with metal in their bodies.
35 0443 1	Sterne N.S.	Occasionally a patient is slightly dizzy after the treatment because of so much heat.
35 0534 1	Raytheon CMD 8 " CMD 13	Odd minor skin focal burn during 39 years.
35 0599	Burdick MF 490 Birtcher 505	Very rarely increase in pain is produced during or after treatment.
35 0615	Siemens 608	Faintness, increase in pain - but in- frequently.
35 0618	Siemens 303 " 608	Occasional complaint of increased dis- comfort.
35 0650	Siemens 608 " 603	Occasional increased symptom and signs, such as increased swelling and pain.
35 0677	Siemens 608 Burdick MF 490	Occasionally patients report an increase in pain intensity during and after treatment, but this disappears if treat- ment is discontinued.
35 0684 1	Sterne SB	N/A, except occasional overheating with Sterne supertherm - (S.W.) - minimal !!

Form	Device	Effect
35 0730	Siemens 608 H	Therapeutic short-wave applications - on occasion, it has been noted that pain is increased in the part being heated.
35 0734 1	Siemens 514 " 603	First degree burns very infrequently.
35 0737	Siemens 608	Some patients with severe blood pressure or heart problems were observed to have either dizziness in former or chest pain in latter, even when S.W.D. applicators were not near to the heart.
35 0791	Siemens 608 " 603	The only adverse effects noted in treatment are minor dizzy spells and/or increased discomfort.
35 0825	Siemens 608 " 608 H " 305	Occasional minor superficial burns
46 1005	Erbe 94	Machine overheats, burning electrodes, towels etc.
47 0010 2	Siemens 608	1) Diarrhea in one patients - 2) occasional increase in pain.
48 1221	Burdick MF 490	1) 3 or 4 cases of slight nausea (in 16 years) following S.W.D. to spine 2) a temporary increase in shoulder pain following treatment by S.W.D. to recent shoulder injury, i.e. condition too acute.
48 1235	Siemens 608	Increase in pain could result in some patients.
48 1266	Burdick MF 49 " MF 490 " D 900 Siemens 303	External and internal pacemaker interference
48 1313	Birtcher 850	Due to the new studies on the benefits of S.W.D. (in particular), I did not prefer to use this modality. It is unsafe, uncontrollable for purposes of administration to patient physiologically benefits are now being seriously questioned.

Form	Device	Effect
48 1362	Burdick MF 490	Occasionally an increase in pain, short-wave diathermy treatment then discontinued.
59 0053 2	Siemens 608 " 303	Short-wave burns have occurred when patients have failed to report to the therapist that the application was uncomfortably hot.
59 1502	Valleylab SSE2K Birtcher 770	Occasional burns
99 0001 3	Bosch 125231	Occasional pain.

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80-EHD-52
CANADA-WIDE SURVEY OF NON-IONIZING RADIATION
MEDICAL DEVICES. PART I. SHORT-WAVE AND MICRO

RESOURCE CENTRE
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